NOTES ON INDIAN GRASSES—X: PROLIFERATION IN *ERAGROSTIS* P. BEAUV. AND *BROMUS* L.

Ordinarily, proliferation means bearing offshoots or redundant parts, or an abnormal multiplication of certain plant organs. In the context of grasses, conversion of the spikelet, partially or wholly into a leafy shoot is also termed proliferation. Usually, the parts above the involucral glumes, i.e. the lemmas, paleas, etc., get converted into leafy shoots.

Proliferation has often been treated as synonymous with vivipary. According to Arber (1934), the term vivipary should be restricted to those cases where seeds germinate *in situ* on the mother plant, as in certain mangrove species and in some bamboos; and should be considered distinct from proliferation. However, several agrostologists—even recent workers—have freely used the word vivipary for abnormalities resulting from apogamy and proliferation.

In India, proliferation has been reported (among grasses) in species of the genera *Festuca* L., *Deschampsia* P. Beauv. and *Poa* L. (Bor 1960).

Recently, while examining some material of the genera *Eragrostis* P. Beauv. and *Bromus* L., some specimens showing marked proliferation were observed.

Bromus L.

A specimen of *Bromus inermis* Leyss. collected by Duthie (no. 14069) in September 1893 from Kashmir was recently referred (by DD) to the author for determination; this showed marked proliferation. The specimen has a large panicle; almost all spikelets have proliferated; in most of them even the lowest two glumes are greatly altered, only a few have conserved their structure. The specimen bears the name *Bromus inermis* Leyss. in Duthie's own hand. The vegetative parts—culms, old and new leaf-sheaths, ligules and leaves—resemble *B. inermis* var. *inermis*. In this specimen two types of proliferation has taken place (Fig. 1 and 3).

In the first type (Fig. 1), the spikelet maintains some external resemblance to the normal spikelets of this grass. A dissection of the spikelet, however, revealed very interesting case of proliferation (Fig. 2). The involucral glumes (b, c) had only slightly changed; they became larger and many-nerved. The three lemmas (d, f, g) had considerably changed, they became much larger in size (the size increasing upwards d to g), and became many-nerved; that is, they had partially changed into leafy structures. One of these modified 'lemmas' (d) had a rudimentary palea (e). These three 'lemmas' were found to be inserted very close on the axis. Beyond the third lemma (*i.e.* beyond the insertion of g), the axis got abnormally prolonged (h); this seems to represent the culm of the new leafy shoot, because at the next node of this culm, a leaf (i) with distinct sheath, ligule and blade was produced. The next internode (j) was very narrow, slender, slightly coiled; the node bore a leafy structure (k) and a rudimentary spikelet (l); two similar internodes then followed (m, n, o), bearing at the tip a rudimentary spikelet. This ultimate spikelet had six glumes (p to u); the lower two (p, q) with the shape and nervation of involucral glumes, the next two (r, s) almost resembling normal lemmas, and the uppermost two (t, u) rudimentary lemmas with a small body and long awns.

The spikelet had proliferated first into a partially vegetative structure (from d to g), then to a distinctly leafy shoot (h to k) and again reverted to a panicle-like structure (l to u).

The other type of proliferation had resulted in the characteristic falcate leafy shoots. The size of the proliferated spikelets had increased enormously (Fig. 3); the inner leafy lobes became very mealy, thick and dark-brown in color.

Eragrostis P. Beauv.

Two collections of *Eragrostis gangetica* (Roxb.) Steud. have been found with proliferous spikelets. One collection was made by King in November 1878 from Siliguri and other by Clarke in April 1868 from Kashimpore, Dacca. King seems to have gathered several specimens because one sheet representing same collection has two normal specimens of the grass *E. gangetica* mounted on it; proliferation is not seen there. The other sheet also has two specimens; the panicles in both these plants have mostly proliferated spikelets and a few normal spikelets.

Fig. 4 shows a proliferated raceme of *E. gangetica*. One spikelet (a) at bottom is normal; even seed setting has taken place in it. In other spikelets (b, c, d) the involucral glumes have merely become enlarged in size, but the remaining parts of the spikelets are replaced by leafy shoots. In several of these shoots, the leaf-sheath, ligule and blade are distinctly demarcated. The blades of these leaves are usually twisted (to right or left, both conditions seen), and are characteristically falcate.

Crowding of several normal and proliferated spikelets at the tip of an elongated rhachis is seen in King's specimen; this resembles the 'bouquet' type of abnormality reported by Arber (*loc. cit.*) in certain species of *Dactylis* L., etc.

Clarke's collection comprises four specimens mounted on one sheet; two are normal, and two show marked proliferation.

Arber (*loc. cit.*) has stated that the best time to look for proliferous specimens is between September and December, or after a wet summer. The specimens of King (collected in November) and Duthie (collected in September) support this view.

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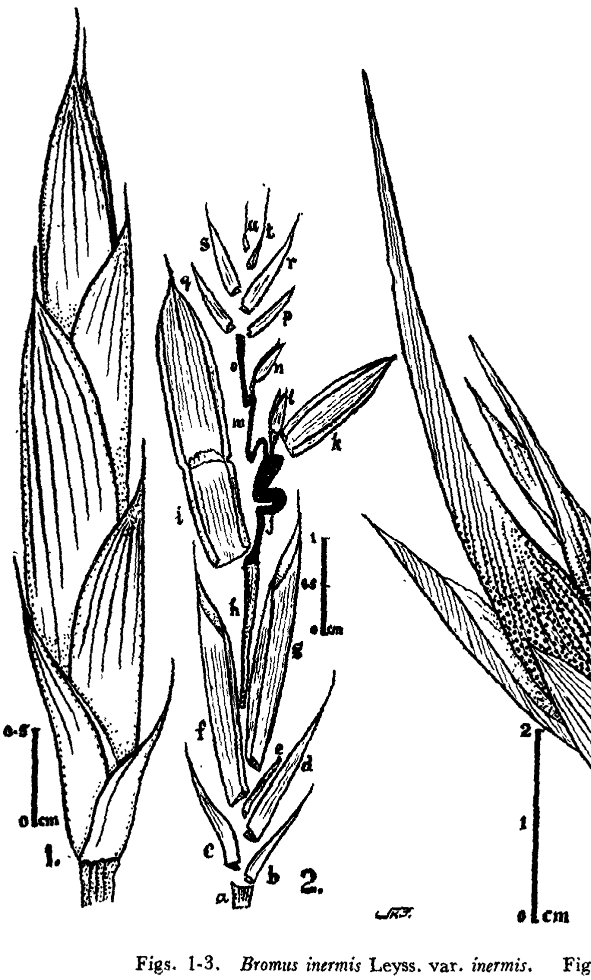

Figs. 1-3. *Bromus inermis* Leyss. var. *inermis*.

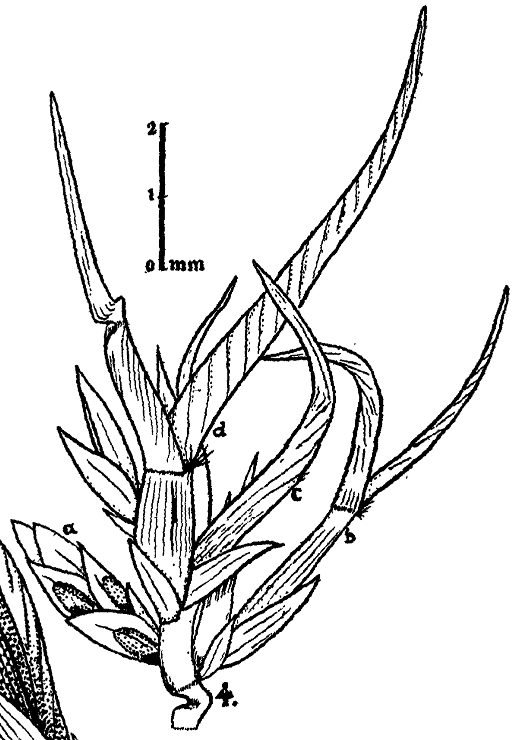

Fig. 4. *Eragrostis gangetica* (Roxb.) Steud.

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